

microscope, albeit one that provided less resolution than van Leeuwenhoek's single lens. Hooke published many drawings from his microscopic observations of such biological objects as insects, sponges, bryozoans, foraminifera, and bird feathers in his 1665 book *Micrographia*. The most celebrated image in the book is a drawing of cork, in which he identified small cavities that he labeled *cells*³ (see Figure 3.1).

I took a good clear piece of cork, and with a pen-knife sharpened as keen as a razor, I cut off . . . an exceeding thin piece of it, and placing it on a black object plate, cause it was itself a white body, and casting the light on it with a *plano-convex glass*, I could exceedingly plainly perceive it to be all perforated and porous, much like a honey-comb, but that the pores of it were not regular; yet it was not unlike a honey-comb in these particulars. First, in that it had a very little solid substance, in comparison of the empty cavity that was contained between . . . Next, in that these pores, or cells, were not very deep, but consisted of a great many little boxes, separated out of one continued long pore . . . (Hooke, 1665, pp. 112–13)

Two types of artifacts produced by simple lenses seriously hampered advance in microscopic observation for two centuries. Spherical aberration resulted from the fact that light rays that leave a lens at different distances from the axis come into focus at different points. Chromatic aberration resulted from the fact that when light passes through a lens, the component wavelengths refract to different degrees. These aberrations often resulted in misleading observations, especially when their effects were compounded by use of a multi-lens system. At the beginning of the nineteenth century researchers such as Henri Milne Edwards and René Joachim Henri Dutrochet spoke of seeing *globules*, which they construed as the building blocks of organisms.⁴

³ The Latin term *cella* designates a small room (and was applied, for example, to the small memorial chapels erected in cemeteries). The choice of the term reflects the fact that for Hooke, focusing on plants, it was the walls surrounding a cavity that made for cells. E. B. Wilson commented on the adoption of the name: "The term 'cell' is a biological misnomer; for whatever the living cell is, it is not, as the word implies, a hollow chamber surrounded by solid walls. The term is merely an historical survival of a word casually employed by the botanists of the seventeenth century to designate the cells of certain plant-tissues which, when viewed in section, give somewhat the appearance of a honeycomb." Wilson went on to say with respect to the conception of cell that had emerged by the end of the nineteenth century: "Nothing could be less appropriate than to call such a body a 'cell' " (Wilson, 1896, pp. 13–14).

⁴ Reference to *globules* as the units in animal tissue goes back at least to Leeuwenhoek. Unlike plants, the units in animals lacked walls and thus the term *cell* was not regarded as appropriate. One of the tip-offs to the fact that these observers were seeing artifacts, not actual cells, was their insistence that the units were of uniform size. Milne-Edwards contended that all animal tissue is comprised of "a rather large number of these corpuscles which might differ in their constitution,